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Applicant: Danmarks JordbrugsForskning
Den Kongelige Veterinær- og Landbohøjskole
"Cikorie"
Our ref.: P738PC00 - MNN/stc

Dear Sirs

This is in response to the Written Opinion dated 29 June 2005.

A processed product

The applicant is still of the opinion that a processed product cannot be chicory that has been harvested and e.g. stored in a pile. The processes leading to a processed product cannot be when the chicory roots spontaneously begin to dry in some areas of a pile and begin to root in other areas.

Examples of processing of plant roots are:

- "Ginseng root is processed into a wide range of products, including tea, candies, beverages, tablets, and capsules." From: http://www.agr.gc.ca/misb/spec/index_e.php?s1=gin&page=intro
- "Processing cassava leaves: The fresh cassava leaves were collected before harvesting. For cassava leaf meal, the cassava leaves were dried under sunlight and ground by machine. For ensiling, cassava leaves were mixed with 10% cassava root meal and salt (1 kg salt for 1 tonne of cassava leaves), put in plastic bags and incubated for 45-50 days before feeding." From: <http://www.mekarn.org/procbuf/sanh.htm>
- "Sugarbeets are stored outside throughout the winter before processing." From: <http://www.mda.state.mn.us/MAITC/sugrbeet.pdf>
- "Beet sugar processing is similar, but it is done in one continuous process without the raw sugar stage. The sugar beets are washed, sliced and soaked in hot water to separate the sugar-containing juice from the beet fiber. The sugar-laden juice is purified, filtered, concentrated and dried in a series of steps similar to cane sugar processing." From: <http://www.elmhurst.edu/~chm/vchembook/546sucrose.html>

- "Ensiled cassava root (ECR) was produced by washing and grinding (or chipping) the fresh roots and adding salt (0.5% of the fresh weight of the root). The material was ensiled immediately after processing, either in pits dug out of the ground, in a cement container or in plastic bags." From: <http://www.cipav.org.co/lrrd/lrrd9/2/loc922.htm>
- About chicory roots: "The roots may be piled in the field for a while, or taken directly to a factory to be processed for root-chicory. At the factory, roots are washed, sliced into cubes about 2.5 cm square, and dried over fire. Dried chicory may be stored indefinitely." From: http://www.hort.purdue.edu/newcrop/duke_energy/Cichorium_intybus.html

Thus the person skilled in the art would not consider chicory roots stored in a pile to be processed chicory roots.

The description of the present application shows in Table 17 on page 68 and in Fig. 6 and 10 that feeding the animals with dried chicory roots can improve the results when compared to feeding animals with crude chicory roots.

Content of chicory roots

Examiner states that it is known to the skilled person that chicory/chicory product contains inulin in addition to sugars and/or secondary metabolites.

It is not known to the skilled person at the priority day of the present patent application that inulin together with the sugars and/or secondary metabolites will improve the results on the features mentioned in claim 1 point a) to f) when compared to pure inulin.

This is due to the release profile of inulin from the chicory. In the intact plant material the inulin and secondary metabolites are confined in slowly degradable/digestible plant cells. This results in a slower release profile in the gastrointestinal tract of these compounds compared to purified inulin. The positive effect of these compounds are therefore not confined to a relative limited section of the gastro-intestinal tract but to the whole length of the tract. This is of importance as the beneficial effect of these compounds has to act in the whole length of the intestine, and not to a confined section e.g. caecum or first part of the colon.

Claim 44

Claim 44 has been amended by introducing the steps i to v from claim 1.

Novelty and inventive step

The document D1 discloses feeding animals with crude chicory roots. D1 does not mention the use of processed chicory roots. As described above the dried chicory roots increases the effect when compared to crude chicory roots.

Document D2 discloses use of chicory inulin extract for pigs over 30 kg. An inulin extract does not contain one or more low molecular sugars and/or one or more secondary metabolites as in claim 1 of the present invention. When comparing inulin extract and a processed chicory product used as a feed, the latter gives better results as shown in the present application in e.g. Table 10 on page 56 and Table 17 on page 68.

Document D4 discloses the use of crude chicory as a feed to goats. Thus it is not a processed chicory product as in the present application. Thus claim 1 is novel in respect of D4. Furthermore the document describes that tenderness and juiceness of the goat meat is impaired, and it does not state whether the meat flavour is improved, it only states in point 4 of the abstract that meat flavour is distinct.

Document D7 discloses chicory pulp used as a pet food product. D7 does describe that the animal is slaughtered, thus the document is not destroying novelty nor inventive step of claim 1 of the present invention.

We respectfully hold the opinion that the present invention is novel and include an inventive step.

In case the Examiner cannot accept the application in its present form, we hereby respectfully request an additional written opinion under Rule 66.4(a) PCT, an additional opportunity to submit amendments or arguments under Rule 66.4(b) PCT or informal communication e.g. a telephone interview under Rule 66.6 PCT.

Yours sincerely
HØIBERG A/S

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Enclosed: Amended claims

Claims

1. Use of a processed chicory product for the production of an animal feed product for

5 a) reducing taint in said animal and/or
 b) reducing the skatole content in said animal and/or
 c) reducing the androstenone content in meat and/or fat and/or blood of
 said animal and/or
 d) improving the sensory characteristics of meat of said animal and/or
10 e) reducing malodour in the environment around said animal and/or
 f) reducing the amount of infections of the gastrointestinal tract of said
 animal

wherein said processed chicory product comprises inulin and

15 • one or more low molecular sugars and/or
 • one or more secondary metabolites, and

wherein said processed chicory product is

20 i. a silage product and/or
 ii. a fermented product and/or
 iii. a heated product and/or
 iv. a dried product and/or
 v. an extract, and

25 wherein said feed product is fed to an animal at least one day prior to
 slaughtering said animal.

30 2. The use according to claim 1, wherein the processed chicory product is fed
 to the animal for at least two days, for example 3 days, such as at least one
 week, for example at least 1.5 weeks, such as at least 2 weeks, preferably at
 least 3 weeks, such as at least 4 weeks, for example at least 5 weeks, such
 as at least 6 weeks, for example at least 7 weeks, such as at least 8 weeks,
 for example at least 9 weeks, such as at least 10 weeks, for example at least
 15 weeks, such as at least 20 weeks.

3. The use according to claim 1-2, wherein the processed chicory product is fed to the animal substantially until slaughter.
4. The use according to any of the preceding claims, wherein the processed chicory product is fed to the animal daily.
5. The use according to any of the preceding claims, wherein the chicory root product is fed to the animal at least one time a day such as several times daily, such as 2 times, 3 times, 4 times, 5 times, or more than 5 times.

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6. The use according to any of the preceding claims, wherein the processed chicory product comprises at least 2.5 % on a daily energy basis of the ration of the animal.

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7. The use according to claim 6, wherein the chicory root product part of the ration of the animal is at least 5 % on a daily energy basis.

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8. The use according to claim 6, wherein the chicory root part comprises at least 10 % of the ration, more preferably at least 15%, more preferably at least 20%, more preferably at least 25%, more preferably at least 30 %, for example at least 35%, such as at least 40%, for example at least 50%, such as at least 60%, for example at least 75%, such as at least 90%, for example substantially 100%.

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9. The use according to any of the preceding claims, wherein the animal is a ruminant, such as cow, sheep, goat, buffalo.

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10. The use according to any of the preceding claims 1 to 6, wherein the animal is a monogastric species, such as horse, pig, poultry, dog, and cat.

11. The use according to claim 10, wherein the monogastric species is a pig.
12. The use according to claim 11, wherein the pig is a male pig.

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13. The use according to claim 12, wherein the pig is an entire male pig.

14. The use according to claim 11-13, wherein the animal is a pig having a weight from 25 to 300 kg, preferably as from 55 to 160 kg.
- 5 15. The use according to any of the preceding claims, wherein the species of Chicory is *Cichorium intybus L.*
- 10 16. The use according to any of the preceding claims, wherein the processed chicory product comprises chicory roots which contain at least 5% inulin, more preferably at least 10% inulin, more preferably at least 15 % inulin, more preferably at least 20 % inulin, such as at least 25% inulin, for example at least 30 % inulin.
- 15 17. The use according to any of the preceding claims, wherein the processed chicory product comprises chicory roots which contain at least 5% FOS, more preferably at least 10% FOS, more preferably at least 15 % FOS, more preferably at least 20 % FOS, such as at least 25% FOS, for example at least 30 % FOS.
- 20 18. The use according to any of the preceding claims, wherein the processed chicory root product is a disintegrated product, such as a powder, flakes, pulp, slices, flour, pellets.
- 25 19. The use according to any of the preceding claims, wherein the processed chicory product comprises an inulin fraction and a low molecular weight fraction comprising coumarins and/or sesquiterpenes.
- 30 20. The use according to any of the preceding claims, wherein the skatole content of blood is reduced by at least 25%, more preferably at least 40%, more preferably at least 50%, more preferably at least 75%, more preferably at least 80%, more preferably at least 90%, more preferably at least 95%, more preferably at least 98%, more preferably to substantially 0.
- 35 21. The use according to claim 21, wherein the skatole content of blood and/or backfat is reduced to below the human sensory threshold.

22. The use according to claim 1-19, wherein the skatole content of backfat is reduced by at least 25%, more preferably at least 40%, more preferably at least 50%, more preferably at least 75%, more preferably at least 80%, more preferably at least 90%, more preferably at least 95%, more preferably at least 98%, more preferably to substantially 0.

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23. The use according to claim 1-19, wherein the androstenone content is reduced by at least 10%, more preferably at least 25%, more preferably at least 40%, more preferably at least 50%, more preferably at least 75%, more preferably at least 80%, more preferably at least 90%, more preferably at least 95%, more preferably at least 98%.

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24. The use according to claim 23, wherein the androstenone content in meat and/or fat is reduced to below the human sensory threshold.

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25. The use according to claim 1-19, wherein improving the sensory characteristics meat comprising improving the sensory characteristics odour, flavour, taste and/or aftertaste of meat from a human sensory perspective.

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26. The use according to claim 25, wherein the improvement of sensory characteristics is a reduction of boar taint comprising reducing Piggy/Animaly-odour and/or Piggy/Animaly-flavour to an acceptable level from a human sensory perspective.

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27. The use according to claim 25, wherein the improvement of sensory characteristics is a reduction of boar taint comprising increasing acceptable sensory characteristics selected from the group of Fresh cooked pork meat like-odour and flavour, Sweet meaty-odour, Sweet-taste, Umami-taste, Meat/Gamey-odour and flavour, Herby-flavour, Spicy-flavour and Heat/spicy aftertaste, Nutty-odour, Metallic-flavour, Meat/Gamey-flavour, Herby-flavour, Spicy-flavour, Lactic/fresh sour-flavour.

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28. The use according to claim 25, wherein the improvement of sensory characteristics is a reduction of lipid-oxidation comprising increasing

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acceptable sensory characteristics selected from the group of Cardboard-odour and flavour and Linseed oil-odour.

29. The use according to claim 25, wherein the improvement of sensory
5 characteristics comprises reduction of sensory characteristics selected from the group of: Piggy/Animaly-odour and flavour, Manure/Stable-odour and flavour, Livestock/Barney-flavour, Cooked liver/Organy-flavour, Musty-odour, Urine-odour, Sweat-odour, Flat Bitter-aftertaste, White pepper-flavour, Chemical/medicinal-aftertaste, Unacceptability.

10 30. The use according to claim 29, wherein the improvement of sensory characteristics comprises improving sensory characteristics such that Hardness-texture is decreased and Tenderness and Juiciness texture are increased and are involved in improving acceptability

15 31. The use according to claim 1-19, wherein reducing of malodour in the environment is caused by a relative reduction in skatole and/or p-cresole and/or indole in the gastrointestinal tract of said animal.

20 32. The use according to claim 31, wherein reducing of malodour in the environment is caused by a relative increase in the amount of 2-pentanon and/or ethylbutyrate and/or propylpropionate and/or propylbutyrate and/or butanoic acid 2-methyl-ethylester in the gastrointestinal tract of said animal.

25 33. The use according to claim 32, wherein the monogastric animal is a furred animal, such as mink, fox, mouse, cat, muskrat, rabbit, hare, wolf, dog.

30 34. The use according to claim 32, wherein the monogastric animal is an animal used for meat, such as pig, poultry, rabbit, hare, more preferably wherein the monogastric animal is a pig.

35. The use according to any of the preceding claims 31 to 34, wherein the malodour is stable malodour and the animal is kept in a stable.

36. The use according to claim 35, wherein the animal is kept in the stable for at least 8 hours a day.

5 37. The use according to any of the preceding claims 32 to 36, wherein the malodour is manure malodour and the manure originates from animals fed with the chicory root product.

10 38. The use according to claim 1-19, wherein the infections are infections with parasites.

15 39. The use according to claim 38, wherein the parasites are worms.

40. The use according to claim 38, wherein the reduction is a reduction of the number of eggs in the animal faeces.

20 41. The use according to claim 38, wherein the infections are microbiological infections selected from *Coli*, *Salmonella*, *Campylobacter* and *Yersinia*.

42. The use according to claim 41, wherein the infections are worms selected from *Ascaris suum*, *Oesophagostomum dentatum*, *Oesophagostomum quadrispinulatum*, *Oesophagostomum brevicaudum*, *Oesophagostomum granatensis*, *Oesophagostomum georgianum*, *Haemonchus contortus*, *Trichuris suis*, and *Strongyloides ransomi* and *Trichinella* spp.

25 43. A method for preparing a processed chicory food product comprising inulin and

- one or more low molecular sugars and/or
- one or more secondary metabolites,

said method comprising the steps of

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- providing chicory roots,
- processing said chicory roots by
- a) ensiling and/or
- b) fermentation and/or
- c) heating and/or
- d) drying and/or

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- e) extracting
- obtaining the processed chicory product.

5 44. A processed chicory product comprising components from chicory roots, where said components comprises at least inulin, and

- one or more low molecular sugars and/or
- one or more secondary metabolites and

10 wherein said processed chicory product is

- i. a silage product and/or
- ii. a fermented product and/or
- iii. a heated product and/or
- iv. a dried product and/or
- v. an extract.

15 45. The processed chicory product according to claim 46, wherein said low molecular sugars are selected from the group of glucose, fructose, sucrose, maltose, maltotriose, maltotetraose, fructan (tri to octasaccharides).

20 46. The processed chicory product according to claim 44 to 45, wherein said secondary metabolites are selected from the group of terpenes, phytosterols, polyamines, coumarins and flavonoids.

25 47. The processed chicory product according to claim 44 to 46, wherein said secondary metabolites are selected from the group of Sesquiterpene lactones such as 8-Deoxylactucin, crepidiaside, lactucin, lactupicrin, crepidraside, 11- β -13-dihydrolactucin, picriside, sonchuside A, sonchuside C, cichoriolide A, cichoriosides A, cichorioside B and cichorioside C; Phytosterols such as Sitosterol, stigmasterol, and campesterol; Coumarines such as Esculetin (=aesculetin), esculin (the glucon of esculletin), cichoriin-6'-p-hydroxyphenyl acetate and cichoriin; Flavonoids such as Luteolin 7-glucuronide, quercetin 3-galactoside, quercetin 3-glucuronide, kaempferol 3-glucoside, kaempferol 3-glucuronide, isorhamnetin 3-glucuronide; Anthocyanins such as Cyanidin 3-O- β -(6-O-malonyl)-D-glucopyranoside and four delphinidin derivatives; Caffeic acid derivatives such as Caffeic acid,

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chicoric acid, and chlorogenic acid; Polyamines (biogenic amines) such as Putrescine, spermidine, spermine.

48.

5 The processed chicory product according to claim 44 to 47, wherein said processed chicory product comprises a chicory product that is:

- a silage product and/or
- a fermented product and/or
- a heated product and/or
- a dried product and/or
- an extract.

10 49. Use of a processed chicory product according to claim 44 to 48 as a feed product for "grown up" (> 7 weeks) pigs.

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50. Use of a processed chicory product according to claim 44 to 48 for preparing a feed product for "grown up" pigs.

20 51. A feed product comprising a processed chicory product according to claim 44 to 48.